

Application No.: 09/758,606
Filed: January 11, 2001
TC Art Unit: 2615
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REMARKS

The foregoing Amendment is filed in response to the official action dated September 11, 2006. Reconsideration is respectfully requested.

The status of the claims is as follows:

Claims 1-25 and 27 are currently pending.

Claims 1-25 and 27 stand rejected.

Claims 1, 20, and 25 have been amended.

The Examiner has rejected claims 25 and 27 under 35 U.S.C. 102(e) as being anticipated by Ladabaum et al. (USP 5,870,351). The Applicant respectfully submits, however, that base claim 25, as amended, and claim 27 depending therefrom, recite non-obvious subject matter that distinguishes over the art of record, and therefore the rejections of claims 25 and 27 under 35 U.S.C. 102 should be withdrawn.

For example, amended base claim 25 recites an acoustic transducer array that includes a backplate having a surface and a plurality of depressions formed on the surface, and a membrane adjacently disposed along the backplate. The membrane and at least one of the plurality of depressions define at least one acoustic transducer. Further, the acoustic transducer array has a bandwidth greater than 5 kHz. As recited in amended claim 25, the

-13-

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Application No.: 09/758,606
Filed: January 11, 2001
TC Art Unit: 2615
Confirmation No.: 9889

respective depressions have variable depths, and the bandwidth of the acoustic transducer array is determined at least in part by the depths of the respective depressions. The subject matter of amended claim 25 is disclosed throughout the present application, for example, see page 9, lines 23-26, and page 10, lines 12-19, of the application.

The official action indicates that the Ladabaum reference discloses an acoustic transducer array that comprises a backplate including a surface and a plurality of respective depressions of varying dimensions formed on the surface, and a membrane adjacently disposed along the backplate, in which the dimensions of the respective depressions are set to determine the center frequency and the bandwidth of the at least one acoustic transducer. The Applicant respectfully submits, however, that the Ladabaum reference neither teaches nor suggests that the respective depressions have variable depths, and that the bandwidth of the acoustic transducer array is determined at least in part by the depths of the respective depressions, as recited in amended base claim 25. Instead, the Ladabaum reference discloses an ultrasonic transducer, in which the individual membranes can be optimized for sensitivity, frequency response, and power output by

Application No.: 09/758,606
Filed: January 11, 2001
TC Art Unit: 2615
Confirmation No.: 9889

varying their size, geometry, and thickness (see column 2, lines 30-34, of Ladabaum et al.).

Specifically, Ladabaum et al. teach a method of fabricating an ultrasonic transducer, in which a plurality of etch holes 21 is formed in gold and silicon nitride layers. The pattern of etch holes 21 is transferred to a wafer by lithography followed by a gold and nitride etch which leaves a plurality of closely spaced holes of, for example, one micron or less in diameter, extending to an oxide layer 17. The wafer is then subjected to a hydrofluoric acid etch whereby the sacrificial oxide layer 17 is etched to provide an extended membrane supported at its edges 22 by silicon oxide. With the pattern of holes having a different number of holes of different spacing, it is possible to form silicon nitride membranes of different sizes and different configurations (see column 3, lines 41-66, and Figs. 3A-3F, of Ladabaum et al.).

The Applicant respectfully submits that the plurality of etch holes 21 formed in the gold and silicon nitride layers of the Ladabaum transducer do not correspond to a plurality of depressions formed on a backplate surface of an acoustic transducer array, as recited in amended base claim 25. Instead, the plurality of etch holes 21 formed on the Ladabaum transducer

-15-

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Application No.: 09/758,606

Filed: January 11, 2001

TC Art Unit: 2615

Confirmation No.: 9889

is merely employed during hydrofluoric acid etching whereby a sacrificial oxide layer 17 is etched to provide extended membranes of different sizes and different configurations (see column 3, lines 56-66, and Figs. 3B-3F, of Ladabaum et al.). The Applicant further points out that the Ladabaum reference neither teaches nor suggests that the thickness of the sacrificial oxide layer 17 is variable to provide, following hydrofluoric acid etching, one or more depressions having variable depths on a surface of the transducer.

Not only does the Ladabaum reference fail to teach or suggest an acoustic transducer array having a backplate with a surface and a plurality of depressions of variable depths formed on the surface, but it also provides no teaching or suggestion that the bandwidth of the acoustic transducer array is determined at least in part by the depths of the respective depressions, as recited in amended base claim 25. Instead, Ladabaum et al. teach that the frequency response of their transducer is determined by the size of the membrane. In fact, Ladabaum et al. emphasize that "the important factor is that the membranes be of different sizes to provide broadband frequency response. Membranes of certain shapes, such as rectangular, may resonate at a plurality of frequencies." (see column 4, lines 29-32, of Ladabaum et al.). In

-16-

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Application No.: 09/758,606

Filed: January 11, 2001

TC Art Unit: 2615

Confirmation No.: 9889

contrast, in the description of his parametric audio system, the Applicant discloses that, by suitably setting the depth of the grooves forming the acoustic transducers 0-11, the frequency response of the acoustic transducer array 122 can be set to satisfy the requirements of the target application. For example, the center frequency of the acoustic transducer array 122 may be made lower by increasing the depth of the grooves, and the bandwidth can be extended by varying the groove depths about the transducer (see page 10, lines 12-19, and Fig. 2b, of the application). As explained above, in the Ladabaum transducer, it is the individual membranes, not the depth of grooves or depressions in the backplate surface, that are optimized for sensitivity, frequency response, and power output by varying their size, geometry, and thickness (see column 2, lines 30-34, of Ladabaum et al.).

Because the Ladabaum reference neither teaches nor suggests an acoustic transducer array, having a bandwidth greater than 5 kHz, that includes a backplate having a surface and a plurality of depressions having variable depths formed on the surface, a membrane adjacently disposed along the backplate, in which the membrane and at least one of the plurality of depressions define at least one acoustic transducer, and in which the bandwidth of

Application No.: 09/758,606
Filed: January 11, 2001
TC Art Unit: 2615
Confirmation No.: 9889

the acoustic transducer array is determined at least in part by the depths of the respective depressions, as recited in amended base claim 25, the Applicant respectfully submits that the Ladabaum reference does not anticipate the subject matter of amended claim 25 and claim 27 depending therefrom. Accordingly, it is respectfully submitted that the rejections of claims 25 and 27 under 35 U.S.C. 102 should be withdrawn.

The Examiner has rejected claims 1, 10-17, and 19-23 under 35 U.S.C. 103(a) as being unpatentable over Manabe (USP 6,678,382) in view of Kamakura et al. (SUITABLE MODULATION OF THE CARRIER ULTRASOUND FOR A PARAMETRIC LOUDSPEAKER). The Applicant respectfully traverses, however, these rejections of claims 1, 10-17, and 19-23 under 35 U.S.C. 103, and submits that base claims 1 and 20, as amended, and the claims depending therefrom, recite non-obvious subject matter that distinguishes over the art of record. Therefore, the rejections of claims 1, 10-17, and 19-23 under 35 U.S.C. 103 should be withdrawn.

For example, the Applicant traverses the Examiner's taking Official Notice (1) that it is well known in the art to provide a matching filter, which serves to compensate for the specific transducer transfer characteristic and thus provide a flat overall frequency response that tailors to match the output shaping

-18-

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Application No.: 09/758,606
Filed: January 11, 2001
TC Art Unit: 2615
Confirmation No.: 9889

characteristics of an amplifier, (2) that it is well known in the art that the plurality of electro-acoustic transducers may be arrayed, and the number thereof can be adjusted to obtain the desired sound pressure such as a loudness greater than $(2.0 \times 10^4) \text{ Pa}^2 \text{ x in}^2$, (3) that it is well known in the art to provide an inductor coupled to a capacitive load of the acoustic transducer array in order to provide the desired power oscillation, and (4) that it is well known in the art to provide a delay circuit configured to apply at least one predetermined time delay to the at least one converted signal in order to control the directivity of the transducer.

Notwithstanding the above traversals of the rejections of claims 1, 10-17, and 19-23 under 35 U.S.C. 103, the Applicant respectfully submits that neither the Manabe reference nor the Kamakura reference teaches or suggests the parametric audio system of amended base claim 1, which includes an acoustic transducer array having a backplate having a surface and a plurality of depressions formed on the surface, the respective depressions having variable depths, a membrane adjacently disposed along the backplate, in which the membrane and at least one of the plurality of depressions define the at least one acoustic transducer, and in which the bandwidth of the acoustic transducer array is determined

-19-

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Application No.: 09/758,606
Filed: January 11, 2001
TC Art Unit: 2615
Confirmation No.: 9889

at least in part by the depths of the respective depressions. The Applicant further submits that neither the Manabe reference nor the Kamakura reference teaches or suggests the parametric audio system of amended base claim 20, which includes an acoustic transducer array having a backplate with a surface and a plurality of depressions formed on the surface, in which the respective depressions have variable depths, a membrane adjacently disposed along the backplate, in which the membrane and the plurality of depressions define the respective acoustic transducers, and in which a bandwidth of the acoustic transducer array is determined at least in part by the depths of the respective depressions.

The Applicant therefore respectfully submits that the combined teachings of the Manabe and Kamakura references would not suggest to one of ordinary skill in this art at the time of the invention the subject matter of amended base claims 1 and 20 and the claims depending therefrom. Accordingly, it is respectfully submitted that the rejections of claims 1, 10-17, and 19-23 under 35 U.S.C. 103 should be withdrawn.

The Examiner has rejected claims 2-5 and 7-9 under 35 U.S.C. 103(a) as being unpatentable over Manabe in view of Kamakura et al., and further in view of Haller et al. (USP 5,619,476) and Hill et al. (USP 5,745,438). The Applicant respectfully traverses,

-20-

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Application No.: 09/758,606
Filed: January 11, 2001
TC Art Unit: 2615
Confirmation No.: 9889

however, these rejections of claims 2-5 and 7-9 under 35 U.S.C. 103, and submits that base claim 1, as amended, and the claims depending therefrom, recite non-obvious subject matter that distinguishes over the art of record. Therefore, the rejections of claims 2-5 and 7-9 under 35 U.S.C. 103 should be withdrawn.

For example, the Applicant traverses the Examiner's taking Official Notice that it is well known in the art to provide a blocking capacitor coupled between the driver amplifier and the acoustic transducer array in order to prevent DC from entering.

Notwithstanding the above traversals of the rejections of claims 2-5 and 7-9 under 35 U.S.C. 103, the Applicant respectfully submits that neither the Manabe reference, the Kamakura reference, the Haller reference, nor the Hill reference teaches or suggests the parametric audio system of amended base claim 1 and claims 2-5 and 7-9 depending therefrom, which include an acoustic transducer array having a backplate having a surface and a plurality of depressions formed on the surface, the respective depressions having variable depths, a membrane adjacently disposed along the backplate, in which the membrane and at least one of the plurality of depressions define the at least one acoustic transducer, and in which the bandwidth of the acoustic transducer array is determined at least in part by the depths of the respective depressions.

-21-

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Application No.: 09/758,606
Filed: January 11, 2001
TC Art Unit: 2615
Confirmation No.: 9889

The Applicant therefore respectfully submits that the combined teachings of the Manabe, Kamakura, Haller, and Hill references would not suggest to one skilled in this art at the time of the invention the subject matter of amended base claim 1 and claims 2-5 and 7-9 depending therefrom. Accordingly, it is respectfully submitted that the rejections of claims 2-5 and 7-9 under 35 U.S.C. 103 should be withdrawn.

The Examiner has rejected claim 6 as being unpatentable over Manabe in view of Kamakura et al., and further in view of Haller, Hill, and Babcock et al. (USP 3,565,209). The Examiner has also rejected claim 18 as being unpatentable over Manabe in view of Kamakura et al., and further in view of Thompson (USP 4,122,725). In addition, the Examiner has rejected claim 24 as being unpatentable over Manabe in view of Kamakura et al., and further in view of Beaver (USP 4,005,382). The Applicant respectfully traverses, however, these rejections of claims 6, 18, and 24 under 35 U.S.C. 103, and submits that base claims 1 and 20, as amended, and the claims depending therefrom, recite non-obvious subject matter that distinguishes over the art of record. Therefore, the rejections of claims 6, 18, and 24 under 35 U.S.C. 103 should be withdrawn.

-22-

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Application No.: 09/758,606

Filed: January 11, 2001

TC Art Unit: 2615

Confirmation No.: 9989

For example, the Applicant respectfully submits that neither the Manabe, Kamakura, Haller, Hill, Babcock, Thompson, nor Beaver reference teaches or suggests the parametric audio system of amended base claim 1, which includes an acoustic transducer array having a backplate having a surface and a plurality of depressions formed on the surface, the respective depressions having variable depths, a membrane adjacently disposed along the backplate, in which the membrane and at least one of the plurality of depressions define the at least one acoustic transducer, and in which the bandwidth of the acoustic transducer array is determined at least in part by the depths of the respective depressions. The Applicant further submits that neither the Manabe, Kamakura, Haller, Hill, Babcock, Thompson, nor Beaver reference teaches or suggests the parametric audio system of amended base claim 20, which includes an acoustic transducer array having a backplate with a surface and a plurality of depressions formed on the surface, in which the respective depressions have variable depths, a membrane adjacently disposed along the backplate, in which the membrane and the plurality of depressions define the respective acoustic transducers, and in which a bandwidth of the acoustic transducer array is determined at least in part by the depths of the respective depressions.

-23-

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Application No.: 09/758,606
Filed: January 11, 2001
TC Art Unit: 2615
Confirmation No.: 9889

The Applicant therefore respectfully submits (1) that the combined teachings of the Manabe, Kamakura, Haller, Hill, and Babcock references would not suggest to one skilled in this art at the time of the invention the subject matter of dependent claim 6, (2) that the combined teachings of the Manabe, Kamakura, and Thompson references would not suggest to one skilled in this art at the time of the invention the subject matter of dependent claim 18, and (3) that the combined teachings of the Manabe, Kamakura, and Beaver references would not suggest to one skilled in this art at the time of the invention the subject matter of dependent claim 24. Accordingly, it is respectfully submitted that these rejections of claims 6, 18, and 24 under 35 U.S.C. 103 should be withdrawn.

The Examiner has rejected claims 25 and 27 under 35 U.S.C. 103(a) as being unpatentable over Haller et al. The Applicant respectfully traverses, however, these rejections of claims 25 and 27 under 35 U.S.C. 103, and submits that base claim 25, as amended, and claim 27 depending therefrom, recite non-obvious subject matter that distinguishes over the art of record. Therefore, the rejections of claims 25 and 27 under 35 U.S.C. 103 should be withdrawn.

-24-

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Application No.: 09/758,606
Filed: January 11, 2001
TC Art Unit: 2615
Confirmation No.: 9889

For example, the Applicant traverses the Examiner's taking Official Notice that it is well known in the art to have a transducer that can efficiently generate and receive ultrasound in air over a broad band of frequencies to generate a desired bandwidth such as a bandwidth greater than 5 kHz in order to obtain a desired sound quality.

Notwithstanding the above traversals of the rejections of claims 25 and 27 under 35 U.S.C. 103, the Applicant respectfully submits that the Haller reference neither teaches nor suggests an acoustic transducer array, having a bandwidth greater than 5 kHz, that includes a backplate having a surface and a plurality of depressions having variable depths formed on the surface, a membrane adjacently disposed along the backplate, in which the membrane and at least one of the plurality of depressions define at least one acoustic transducer, and in which the bandwidth of the acoustic transducer array is determined at least in part by the depths of the respective depressions, as recited in amended base claim 25, and therefore the Haller reference, modified as suggested in the official action, would not suggest to one skilled in this art at the time of the invention the subject matter of amended claim 25 and claim 27 depending therefrom. Accordingly,

-25-

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Application No.: 09/758,606
Filed: January 11, 2001
TC Art Unit: 2615
Confirmation No.: 9889

it is respectfully submitted that the rejections of claims 25 and 27 under 35 U.S.C. 103 should be withdrawn.

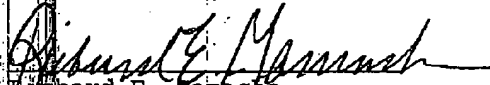
In view of the foregoing, it is respectfully submitted that the present application is in a condition for allowance. Early and favorable action is respectfully requested.

The Examiner is encouraged to telephone the undersigned Attorney to discuss any matter that would expedite allowance of the present application.

Respectfully submitted,

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-26-

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